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PRINCIPAL PAPER

PLANT-SKIN INTERACTIONS 1/

By

Daniel D. Palmer, M. D.

Plants may injure the skin in a variety of ways. A person picking a pricklypear cactus fruit with his bare hand is clearly reminded of this. A friend on a camping trip who used poison ivy leaves in lieu of toilet tissue had a very annoying demonstration of another type of reaction.

The following discussion will review various types of plant-skin interactions, discuss their mechanisms and briefly review their treatment.

GROWTH ON THE SKIN is an intimate form of plant skin interaction. Three genera of fungi, Epidermophytum, Trichophytum and Microsporum commonly grow in the skin and other genera do so occasionally. These fungi must have the enzymatic equipment necessary to live on keratin, the protein forming the top layer of the skin. Strains of fungi that arise from animals or soil have not learned to survive on human skin because they either grow too slowly and are shed as the skin replaces itself, or they grow too rapidly and penetrate the skin to a level capable of causing enough inflammation to loosen the top layer. When the top layer is loosened and shed, the infection is cured in that area. The "ringworm" fungus infection develops by shedding and clearing of the central area with continuous peripheral spreading as the fungus grows into uninvolved skin. A typical ring forms with central clearing and a margin of activity. Strains of fungi that have evolved with humans usually cause a chronic indolent infection, because they have learned to grow at a rate that prevents shedding yet slow enough to prevent a deeper inflammatory penetration.

1/ Address to the Hawaiian Botanical Society, December 1968.

SHOUT
SHARE
IT

Tinea versicoler, or kani as it is called locally, is caused by the yeast pityrosporum orbiculare. This yeast is an unnoticed normal resident in the pore of the oil glands and hair follicles, but in certain people and more commonly in warm, moist climates its growth may be stimulated. It then grows out of the follicle to form a mat on the top layer of the skin and in the oil film. The mat acts as a very effective sunscreen. In an untanned caucasian the mat may appear tan in color, but when the skin is exposed to the sun, the uninvolved skin tans and the involved areas do not. Thus leaving the affected spots white and very visible. The common belief that kani is an infection picked up at the beach probably perpetuates itself because the disease becomes so much more obvious with the coincidental sun exposure.

Candida albicans is a yeast that is part of the flora of the mouth and gut of many normal people. It is not very aggressive in causing infections but, will cause infections in previously injured areas of the skin or in skin that is constantly moist, warm and dark. Moniliasis (candidiasis) usually involves the armpits, the crotch or the area under heavy, pendulous breasts. Persons with diabetes or certain other serious diseases are prone to this infection.

Fungus infections are treated by a variety of materials that are too toxic to be administered systemically. The skin forms a barrier preventing penetration into the body, but allowing the full toxic dose to reach the fungus. Salicylic acid, certain dyes and certain fatty acids are examples of this type.

Griseofulvin is a fungistatic medicine that is given by mouth. It is absorbed and carried to the bottom layer of skin. As the skin grows out and is shed the newer skin contains the griseofulvin and the fungi which cannot grow in its presence are shed.

MECHANICAL INJURY such as that induced by thorns, thistles, spines, barbs and sharp or serate edges have annoyed us all. Mechanical injury in a less obvious form is the irritation of the mucous membranes caused by oxalate crystals in uncooked taro leaves or in the unripe monstera fruit.

PRIMARY IRRITATION may result from a direct chemical action on the skin. Nearly everyone exposed to a sufficient concentration of an irritant for a sufficient time will develop a rash shortly after the initial exposure. Sticking a finger in an acid is an example of primary irritation. Examples of primary irritation from plants are: the eye damage caused by crown flower sap, the skin irritants and vesiculant saps of many euphorbias. Somewhat peculiar to Hawaii is the skin irritation from pineapple juice seen so commonly in cannery employees. Part is from water and acid exposure, and the enzyme bromelain present in the pineapples probably adds to the problem by digesting skin proteins. The enzyme papain in papayas may contribute to a similar rash on the hands in hotel pantry employees who occasionally prepare 200 or more papayas at one sitting.

Along the windward shores of Oahu during the winter months swimmers will occasionally develop a very severe and annoying rash in the area covered by their bathing suits. The irritation is caused by a chemical produced by seaweed Lyngbya majuscula. If the swimmer showers and gets out of his wet bathing suit immediately after leaving the water this reaction can be avoided.

ALLERGIC REACTIONS to plants are the result of an altered response of an individual to agents that ordinarily would have no irritant effect. A simple non-irritating protein or oil that is tolerated well by most people may cause a severe reaction in an allergic person.

Allergic reactions differ from primary irritation reactions in many ways. Only a small percent of the population develop skin allergies; there is an "incubation period" after the first exposure before another exposure will induce a reaction; very small amounts of material can induce a severe response, and the ability to react can be transferred from an allergic person to one who is not allergic.

There are two types of skin allergy. The IMMEDIATE TYPE OF ALLERGY is seen as urticaria (hives) and a DELAYED TYPE characterized by dermatitis (eczema).

The IMMEDIATE RESPONSE is commonly caused by nuts, strawberries or the plant product penicillin. On the first exposure the allergen stimulates the body to produce antibody. After a period of five to fourteen or sometimes more days re-exposure to the allergen will result in its combination with antibody to form an antigen-antibody complex. This complex causes histamine and other chemicals to be released with the resultant immediate appearance of hives. A severe reaction can produce marked swelling of the tongue, lips or eyelids and very severe reactions can cause death from shock. Antihistamines block the effect of histamines and are useful in this type of allergy. Epinephrine and some of its relatives antagonize histamines' effects and are also used. Cortisone and its relatives will also block the immediate allergic reaction.

The antibodies responsible for the immediate type of allergy can be transferred to another person in the cell free serum. Allergy professors often demonstrate this to medical students by injecting the cell free serum of a patient allergic to peanuts into the skin of their own forearm. The professor then eats a peanut and gets a hive at the site of injection.

The DELAYED RESPONSE has a mechanism much different from the immediate response, and the precise chemical nature of the reaction is not understood. The same initial exposure and incubation period are present, but circulating antibody is not produced. Changes in the lymphocyte (a type of white blood cell) are produced and "cellular antibody" is formed. The delayed response can also be transferred from an allergic person to a nonallergic one, but in this case the lymphocytes must be transferred. The cell free serum has no "cellular antibody" and cannot transfer the delayed allergy.

The typical delayed skin allergy to a plant is characterized by streaks of vesicles appearing where the plant touched the skin. If the exposure is heavy and the person is very allergic the reaction may appear in hours. A lesser exposure to a less allergic person may not produce a rash for days. The popular notion that fluid from the blisters spreads the reaction is not born out in fact. New blisters are actually appearing at sites of lesser exposure later than at sites of heavy exposure giving the impression of spreading.

Almost any plant is capable of inducing an allergic contact dermatitis in some susceptable individual. Certain families stand out as producing more allergy than most. These include the Anacardiacae, Compositae, Liliaceae, Primulaceae,

Umbelliferae, Graminae, Euphorbiaceae and Rutaceae. In this group the Anacardiaceae (poison ivy, poison oak, poison sumac, mango, cashew and the Japanese lacquer tree) are responsible for more rashes than all others combined.

Peculiar to Hawaii is the mango rash. The typical person with this rash grew up and suffered from poison ivy or oak (anacardiaceae) on the mainland prior to moving to Hawaii. During his first year here he will pick or peel the fruit or trim a mango tree (also an anacardiaceae) in his yard and develop a typical poison ivy rash. Paradoxically persons growing up in Hawaii with constant mango exposure rarely develop the rash and show a general lack of reaction when exposed to poison ivy and oak. The chemical responsible for the allergy (pentadecylcatechol) is found in the sap, leaves and skin of the fruit. The fruit is apparently free of the chemical other than that which gets on it during the peeling process.

Other sensitizing plants in the Anacardiacae include the cashew Anacardium occidentale and the Japanese lacquer tree. The cashew nut is free of the allergen, but the fruit and the nut covering are very sensitizing. The Japanese lacquer produced from the lacquer tree causes some distinctive rashes that are helpful in establishing the correct cause. In Japan some saloons will have their bar surfaces painted with the lacquer with the resultant characteristic eruption on the forearms. Some western style hotels in Japan finish their toilet seats with the lacquer, and the resultant rash is absolutely diagnostic.

The Kahili tree (Grevillea banskii) flower is a potent sensitizer. It is much less used for table decorations now than the past when its reputation had not been established. It may be unique in that the flower is the only part of the tree that causes the allergy.

Cortisone-like drugs topically and systemically are the only specific agents effective in treating the inflammation caused by the delayed response. Many other oral medications and a variety of lotions, creams, and dressings are used for symptomatic relief until the allergic reaction clears. Histamine is not important in the delayed response and antihistamines are not important in its treatment. Antihistamines are used occasionally for their non-specific antipruritic and sedative effect.

PHOTOALLERGIC and PHOTOTOXIC reactions appear on the skin of certain individuals when they are exposed to furocoumarin containing plant juices and subsequently exposed to the sun. Skin changes appear at sites exposed to both the furocoumarin and sun, but not at sites exposed to either alone.

A PHOTOALLERGIC reaction has the same delay in onset and the same eczematous appearance that a contact dermatitis (delayed response) has. This reaction may appear on the hands of a man who squeezes persian limes for Mai Tais in the sun on his lanai. He may have avoided a severe hand eczema if he had done the same job inside and washed his hands before sun exposure.

The PHOTOTOXIC reaction is an accentuated sunburn reaction that leaves much residual tanning, and an eczematous rash does not appear. The reaction appears immediately after sun exposure. The fragrant mokihana lei of Kauai may cause this reaction if worn in the sun. The sunburn appears around the neck and on the shoulders in a characteristic pattern, and it leaves a tan that lasts for months. The same lei worn in the evening by the same person will cause no reaction.

The reasons for one person experiencing a phototoxic and another person a photoallergic reaction are not known. Occasionally a person will develop a phototoxic reaction and just as it is settling down a typical delayed photoallergic reaction will develop.

Other examples of plant induced phototoxic and photoallergic dermatitis are the result of the addition of extracts from photosensitizing plants to colognes, perfumes, and aftershave lotions. Oil of Bergamot is the most commonly used. The woman who has worn Shalimar cologne in the evening for years may suddenly develop a sunburn and subsequent tan at the site of its application after she applies it before going out in the afternoon sun. Men may develop a dermatitis on the left check as the result of driving a car in the sun after using Jade East aftershave lotion.

Occasionally children will present themselves with dark streaks and scattered drop-like spots of pigment on their hands and forearms. Careful quizzing may reveal contact with limes before sun exposure and the usual story would be squeezing limes and lemons for a front yard lemonade stand. The pigment is nothing more than a marked local tan induced by the photosensitizing agent.

The photosensitizing chemicals are psoralens (a group of furocoumarins). Through some unknown photochemical reaction they produce chemicals that may cause the immediate phototoxicity, or they may produce other chemicals which induce the allergic response. In plants the psoralens may act as growth inhibitors. They are concentrated in seeds and may be there to delay germination. They may be used by the desert rue to space plants adequately for best use of a sparse water supply.

The family Rutaceae with its lime, bergamot, lemon and mokihana is responsible for most of the plant induced photosensitivity reactions in Hawaii. Many plants in a variety of plant families produce psoralens. The edible fig, meadow grass and pink celery rot are other examples.

Pink celery rot causes a severe eczema on the hands of celery pickers because of its production of a psoralen not present in uninfected celery.

The final form of plant skin interaction I want to mention is HAIR LOSS caused by the ingestion of koa haole (leucaena glauca) seeds, coco de mono (lecythis ollaria) nuts and occasionally from parts of other plants. Koa haole seeds must make up a significant part of a human's diet to cause hair loss. Mimosine is the chemical in the leaves and seeds that is responsible for the loss of the tail and mane of horses using it as forage.

The coco de mono nut of Venezuela is apparently delicious. Monkeys that eat the nuts lose their hair and if they eat too many, they die. There are several reports of humans eating the nut and developing a sudden total hair loss. The chemical responsible for the hair loss has been identified as the selenium analog of the sulfur amino acid cystathionine.

Fortunately skin reactions from plants are exceptional phenomena, and most of our contacts with plants are benign and pleasant in nature. Some of my bald friends have complained that if there are several plants that can cause hair loss there should be at least one that would cause hair growth. The search must continue.

EVENTS

Annual Meeting of Western Society of Naturalists

Co-hosted by University of Hawaii, Hawaiian Academy of Science, and Hawaiian Botanical Society. Indoor technical sessions, 08:30 - 17:30, December 28, 29, & 30, University of Hawaii music building complex. Mornings, Orvis Auditorium, afternoons, Orvis Auditorium, and Rooms 36, 07 + 09. Monday evening, December 28, 19:00 - 22:00, a smoker at Bishop Museum @ $3.00 ea. Wednesday evening, Banquet @ $7.50 ea., location to be announced. Field trips, Dr. A. H. Banner. Plenary Session, December 31, 08:30 - 11:30. The public is invited.

Symposium on Endangered Species of Hawaii

The symposium will be on the program of the annual meeting of the Society of Western Naturalists, December 29, 1970, 8:30 a.m. to noon, University of Hawaii, Honolulu, Orvis Auditorium.

Chairman

William S. Stewart, Scientific Director, Pacific Tropical Botanical Garden, Kauai.

Participants

Ralph E. Daehler, Hawaii Division of Forestry. A review of the flora of Hawaii.

Andrew J. Berger, University of Hawaii. Endemic Hawaiian birds.

C. Robert Eddinger, University of Hawaii. Honey creepers at Kokee.

Wayne C. Gagne, Bishop Museum. Endemic and possibly extinct Hawaiian terrestrial arthropods and possible criteria for their survival.

Dieter Mueller-Dombois, University of Hawaii. Ecosystems.

Russell K. LeBarron, Hawaii Division of Forestry. A forester looks at the endangered species problem.

Charles H. Lamoureux, University of Hawaii. Summary and plans.

Black Twig Borer Threatens Native Trees

The black twig borer, Xylosandrus compactus (Eichhoff), an insidious and notorious pest of fruit, ornamental and forest trees was first discovered at Kailua, Oahu, in November, 1961 where the beetle was found infesting twigs and branches of ornamental pink tecoma trees.

It has since spread to Kauai, Maui and Hawaii and a total of sixty five hosts has been recorded. Of these, seventeen are native trees and shrubs listed below. Attacks on indigenous plants have been observed only on Oahu except as noted in the tabulation.

Host		Host	
Acacia koa	koa	Drypetes phyllenthoides	mehamehame (Oahu & Hawaii)
Aleurites moluccana	kukui nut (Maui only)	Eugenia malaccensis	ohia ai (mountain apple)
Antidesma platyphyllum	hame	Hibiscus tiliaceus	hau
Antidesma pulvinatum	mehame	Myrsine lessertiana	kolea
Alectryon sp.	mahoe	Pe'lea sp.	alani
Claoxylon sandwicense	poola	Perrottetia sandwicensis	olomea (Oahu and Hawaii)
Coprosma sp.	pilo	Pipturus albidus	mamaki
Diospyros Hillebrandii	lama	Pseudomorus brunoniana	aiai
		Sapindus oahuensis	lonomea

Periodic observations on the various islands indicate that it is steadily penetrating forest regions, increasing its host range and causing considerable damage to common and rare tree species.

On a recent trip to Palikea Gulch and vicinity, Waianae Mountains, by a party of botanists, entomologists and graduate students, fourteen black twig borer hosts were recorded. Of these, nine were native trees, seven of which were new host records. New hosts were as follows: (1) Antidesma pulvinatum (haa or hame), (2) Alectryon sp. (mahoe), (5) Claoxylon sandwicense (poola), (4) Diospyros Hillebrandii (lama), (3) Myrsine lessertiana (kolea), (6) Pseudomorus Brunoniana (aiai) and (7) Sapindus Oahuensis (lonomea).

The black twig borer is also a potentially serious pest of coffee but has not been reported from the Kona District to date.

The adult is a tiny dark beetle about 1/16 inch in length and cylindrical in shape. The gravid female beetle bores into a suitable twig or branch where she makes a brood gallery, usually in the central pith region. Between 30 and 50 tiny white eggs are deposited and upon hatching, the legless white beetle larvae or grubs feed upon a fungus mycelium called ambrosia which develops within the brood chambers. Under laboratory conditions the pre-oviposition period is 5 days, egg stage, 3 days, larval stage, 8-15 days and the pupal stage, 5-6 days, giving a complete life history of 21-29 days.

Parasites were introduced for the control of this pest but have not been recovered.

The black twig borer was the first of three important forest insect pests that entered the State within the past decade.

C. J. Davis
State Department of Agriculture

Literature Cited:

Beardsley, John W. 1964. The Black Twig Borer, A Potentially Serious Pest of Coffee in Hawaii. Haw. Farm Science. Vol. 13(1):5-6.

67th Annual Meeting of ASHS

The Annual Meeting of the American Society for Horticultural Sciences, Miami Beach, Florida, November 1-4, was attended by four members of the University of Hawaii including two officers of the Hawaii Botanical Society, Vice-President H. Ronald Hurov and Treasurer Robert M. Warner. Other U. H. participants were Philip Parvin from the field station at Kula, Maui, and Richard Criley, Manoa Campus.

Dr. Richard Criley received the annual award of the Kenneth Post Foundation for Outstanding Graduate Student Research in Floriculture and Ornamental and Landscape Horticulture. He also presented a paper on artificially induced abscission of coconuts. Dr. Warner gave two papers; one about ecological factors on the growth of oranges from five rootstocks in Hawaii; the other about isoenzyme indicators of genetic relationships among citrus species. Dr. Parvin reported on ornamental proteas in Hawaii.

In addition to the 3-day program of papers and Society affairs, another three days of field tours were offered and a number of other organizations held joint meetings. These included the Tropical Section of ASHS, the Florida Horticultural Society, and the American Horticultural Society. Dr. Warner reported that field trips were outstanding. They included a visit to the highly mechanized vegetable production operations at Belglade and visits to citrus areas of central Florida and other fruit and ornamental plant production areas.

Registration totaled 1,150 including 850 scientists and specialists in Horticulture. Separate sessions were held for several subject fields including growth regulators and fruit abscission, growth and development of fruits, environment, nutrition, and propagation.

Letter to the Hilo Campus, U. H.

Under date of October 27, 1970, our President, C. W. Smith has inquired about plans to build a "Dean's House" within the arboretum of the Division of Forestry at Hilo. He expressed concern for the possible loss of specimen trees. A reply from the Chancellor indicated that the University does not have such a plan.

Biological Control of Clidemia?

Under the direction of Clifton J. Davis, Division of Plant Industry, the Hawaii Department of Agriculture will soon release a bio-control organism to attack Clidemia hirta, a noxious exotic plant on Oahu. It is a small white moth, Blepharomastix ebulealis (Guenee), Family Pyralidae. The caterpillars skeletonize the leaves and also cause leaf rolling. The proposed site for field testing was selected in collaboration with District Forester Herbert Kikukawa and his Assistant Forester, Jerry Pelly. It is in the East Range section of Schofield Barracks.

Natural Regeneration of Koa

Acacia koa reproduces primarily from seed. The forest floor under seed-bearing koa trees contains large quantities of viable seed. Mechanical disturbance of the site, or fire triggers germination of dormant seeds, usually producing a profusion of koa seedlings. Over 100,000 seedlings per acre were counted in a disturbed site in

the Waiakea Forest Reserve. In the Kipapa burn area on Oahu, more than 30,000 seedlings per acre were counted in March, 1970 on plots 6 months after the fire.

Studies by the U. S. Forest Service show that such heavy concentrations are shortlived. In the Waiakea Forest plots only 1,650 stems per acre remained 4.5 years after site disturbance. Many were of low vigor or diseased. The causes for such reductions are unknown, although several hypotheses may be put forth; competition of one sort or another being predominant.

In the Oahu plots, mortality during the first 6 months has been about 4 percent. Eighty percent of the deaths were probably due to root crown fungus, Cylindrocladium spp. University of Hawaii pathologists under the direction of Frank Laemmlen are conducting pathogenic studies of this fungus on koa. Field observations indicate that this disease is rapidly increasing and may become the most important killing agent in the seedling stands. Other factors are chlorosis, insect damage, or dieback affecting about one-fourth of the seedlings. Studies of these koa stands are continuing.

Paul G. Scowcroft, Research Forester
U. S. Forest Service
Institute of Pacific Islands Forestry

Bishop Museum New Guinea Field Station

The Bishop Museum New Guinea Field Station was established in 1961 as a base for entomological surveys of various parts of New Guinea and neighboring islands. Plants and vertebrate animals were also collected for purposes of documentation of host-records for various groups of insects and other invertebrate animals. Recently, ecological research has been initiated at the field station and in neighboring environments.

The Field Station is located at Wau, at altitude 1,200 meters, in Northeast New Guinea, 3 hours drive south of Lae. It is near the upper end of the Wau-Bulolo Gorge, which with the associated lower slopes of the adjacent ranges boasts perhaps the greatest concentration of Araucaria forests in New Guinea, with almost equal numbers of both species of New Guinea Araucaria. The field station is near the upper edge of these forests, which are largely merged with subtropical rain forest of mixed broad-leaf trees, with numerous monocots and a few gymnosperms other than Araucaria. This rain forest extends higher up the slopes, without Araucaria, and with palms and other tropical plants gradually dropping out, and Lithocarpus and then higher up Nothofagus (at and above 2,000 meters) in frequent preponderance. At these altitudes and higher, the rain forest becomes moss forest, and the extent of moss and other epiphytes is very impressive. What is said to be the largest moss in the world, a terrestrial type, grows in this zone. It resembles a pine seedling. Hepatics make up nearly 40% of the bryophytes.

The Field Station is located on Edie Creek Road on the side of Mt. Kaindi (2,350 meters). A road goes to the telephone-telegraph repeater station on the summit, via the Edie Creek goldmining area. A branch of the Field Station is now being constructed on the top of Kaindi. This is the only mountain in New Guinea with a road to its summit. From Edie Creek in one day's walk south one may reach the highest point, at 3000 m., of the war-time Bulldog Road across New Guinea. Here there is

luxuriant moss forest, with dwarf forest on the nearby peaks at 3300 m. To the northwest, close by, is Mt. Amingwiwa, 3900 m, highest mountain between the central ranges and the Owen Stanleys. It has extensive alpine grassland along the main ridge. To the north of the Field Station, across Wau Valley is Mt. Missim, 2800 m, covered with rich moss forest. Coffee is cultivated on the floor of the valley, where there is an excellent dairy and where good fruits and vegetables are grown.

The Field Station consists of 16 acres with a laboratory, four houses, two vehicles, and an arboretum under development. This already includes 230 species of trees, some more than 10 meters tall, and most of them native. Among other plants in the gardens are orchids, bryophytes and water plants in some ponds. There is also an aviary and other cages, and a small herbarium and zoological collection. Usually one or more houses are available for renting by researchers or visitors. Wau airport is served by small planes to Lae and Port Moresby, or Goroka, and charter planes, and Bulolo airport, a half hour's drive from Wau, has almost daily larger planes to Lae and Port Moresby. From Wau one may drive to Lae and thence through the entire Eastern, Western and Southern Highlands. This is the only extensive road system in all of New Guinea. Wau may be reached in 24 hours from Honolulu.

J. Linsley Gressitt

PROCEEDINGS OF THE SOCIETY

The following are not complete minutes -- only a few especially significant highlights.

November 2, 1970

a) The nominating committee, Ned Cafford, Chairman, and Ron Hartman and Dan Palmer, members, placed the following names in nomination as candidates for offices of the Society for 1971:

President - H. Ronald Hurov, Field Epidemiologist, Community Studies in Pesticides.
Vice-President - Stephen L. Montgomery, Graduate Student, Entomology.
Treasurer - Paul C. Ekern, Professor of Agronomy and Soil Science.
Secretary - John R. Porter, Graduate Student, Botany.
Trustee - Clifford W. Smith, Assistant Professor, Botany.
Trustee - Beatrice Krauss, Lecturer in Botany.

b) The plant "re-distribution" was a great success.

c) Dr. Doty announced firm dates for the meeting of the Western Society of Naturalists in Honolulu - December 28-30. Members of the Botanical Society are encouraged to participate.

d) Speaker of the evening. Dr. Ted. R. Norton, Professor of Pharmacology, U. H., reported on the University's program of investigation of Natural Products from the Pacific. The major objective is to investigate plant and animal materials which were used by the indigenous peoples of the Pacific Region for medicinal purposes. Samples of biota are extracted and subjected to a variety of pharmacological screening tests including anti-cancer,

anti-bacterial and anti-hypertensive, and then observing central nervous system effects. Active meterials are then subjected to separation procedures to isolate the active component.

A large number of materials have been found active in these tests and are undergoing further study. A sea annelid which may have anti-cancer properties has received attention in the public press. A number of compounds from unrelated sources have anti-hypertensive components including the leaves of Acacia koa. It was mentioned that Lyon Arboretum is useful as a source of many exotic plants. However, a given plant from different geographic locations does not always possess the same properties.

Colored slides were used to illustrate scenes from places visited, personnel, and some of the materials which have been studied.

December 7, 1970

a) Nominees for offices as reported in the November 2 meeting were all elected.

b) Dr. Robert Warner reported briefly on some new citrus hybrids, the parents chiefly tangerines.

c) Currently, Society membership is 233.

d) Steve Montomery of the Axis Deer Committee reported that the Advisory Council authorized by Act 195-1970 has not been appointed as of the present date.

e) Speaker of the evening, Clifford W. Smith, Retiring President's address, Lichens of Hawaii.

Report of the Treasurer for the year ended November 30, 1970

Balance of Bank and Savings Accounts as of November 30, 1969		
First Hawaiian commercial account	$ 72.14	
First Federal Savings and Loan		
Acct. No. 035259 (Marie Neal bequest)	10,124.17	
Acct. No. 014983	705.72	
		$10,902.03
1970		
Receipts		
Dues	$ 734.00	
Interest, First Federal Savings & Loan Assn.		
Acct. No. (035259) 041587	576.84	
Acct. No. (014983) 041588	38.28	
Donation (Degener)	50.00	
		$ 1,399.12

Expenditures		
Mailing services -- meeting notices, newsletter, etc.	$ 373.72	
Preparation of newsletter -- typing, duplicating, etc.	339.10	
Treasurers billing and mailing	49.39	
Membership dues to other organizations		
Nature conservancy	10.00	
Flora Pacifica	25.00	
Hawaiian Garden's Foundation	25.00	
Friends of Foster Garden	25.00	
Award for best botanical exhibits		
Hawaiian Academy of Science	40.00	
Award to outstanding University of Hawaii		
Botany student	25.00	
Axis Deer Survey	50.00	
		$ 962.21

Balance of Bank and Savings Accounts as of November 30, 1970

First Hawaiian Bank commercial account	$ 343.93	
First Federal Savings & Loan Assn. (Nov. 11, 1970)		
Acct. No. 041587*	10,701.01	
Acct. No. 041588	294.00	
		$11,338.94

* Marie C. Neal bequest

Robert M. Warner, Treasurer

PUBLICATIONS

Review

Mammals of Hawaii: a Synopsis and Notational Bibliography. Dr. P. Quentin Tomich, 1969. 139 pages of text plus 85 pages of bibliography. Illus. Lancaster Press. Issued by Bernice Pauahi Bishop Museum as its 80th Anniversary Achievement. $5.00.

--Review by Otto Degener--

This book held my interest throughout one sitting to the end of its 139 pages of text. Though mammals are hardly plants, they certainly have influenced our Hawaiian vegetation. They have aided in pollination and seed distribution and they have hindered the healthy growth of our endemics by browsing, trampling, and denuding particularly slopes and geologically recent lava areas of top soil.

Dr. Tomich gives a four-page check list of names of the Class Mammalia, found in and about the Hawaiian Archipelago, down to varietal names. Whales and allies number seventeen, all indigenous to our waters and hence not requiring inclusion in a special table. This last gives a glance the distribution on our eight principal islands and on the seventeen smaller ones extending westward toward Japan such established mammals as the wallaby, hoary bat (Lasiurus cinereus semotus), rabbit, roof rat, Norway rat, Polynesian rat, house mouse, Guinea pig, dog, mongoose, cat, monk seal (Monachus schauinslandi) horse, (mule), donkey, pig, axis deer, mule deer, pronghorn (antelope), water buffalo or carabao, cattle, goat, sheep and mouflon. Of this conglomeration, only the hoary bat, the monk seal and the Polynesian rat are considered endemic. The ancestors of the first obviously flew here from America, those of the second swam here perhaps from the Bahamas when the Isthmus of Darien was below the surface of the ocean, and those of the last probably arrived here as stowaways among coconuts - can't you visualize their beady eyes and twitching whiskers peeping forth - or other baggage transported by the Hawaiian people's Polynesian forebears in their giant double canoes from the southsouthwest. Besides introducing the rat to the Hawaiian Islands, the Polynesians brought the dog and the pig.

The forty-five figures in the text are mostly photographs, many excellent and a few perhaps a bit dark, a necessary evil when trying to snap a feral animal that skulks out of sight in preference to saying "cheese" to be photogenic. The book is particularly fascinating to the reviewer as he has observed many of the author's subjects in the field and is enlightened regarding their native home, habits and the conditions and dates of their local introduction.

Regarding the monk seal, a neighbor long resident at Mokuleia Beach, Oahu, informed the reviewer a specimen once appeared on the reef fronting his home. Regarding feral donkeys, popularly called "Kona nightingales", herds in the Kau Desert, Island of Hawaii, were said to paw open naturalized watermelons (before the introduced melonfly exterminated them) to gain necessary moisture. Only three such wild donkeys were known to the reviewer in 1969, beautifully sleek specimens with a few prominent zebra-like stripes. As some trigger-happy nitwit might go looking for them, their range shall remain a secret. In Wailau, Molokai, in 1928 such abandoned donkeys with long, curved hooves that had failed to wear down properly in the muck of this rain-swept valley, visited the reviewer at his base camp near shore. Dependent on browsing the lush vegetation, they gloried in eating for a change the dry newspapers needed for the pressing of botanical specimens. On Kauai about a hundred years ago, according to a part-Hawaiian assistant, his German immigrant grandfather found it profitable to periodically shoot some of his half-wild cattle, slice through their leathery hides, and let his marketable hogs fatten on the carcasses. In Honolulu, during the '20s and '30s, Chinese would cut the Honolulu residents' unwanted algaroba trees for the wood. This was used to boil the garbage collected from the householders for the piggeries situated in the suburbs. One pig farmer, invited to explain his business to the members of the University of Hawaii's Aggie Club, perhaps to flatter his audience, related that the very best swill came from the University cafeteria. Regarding the water buffalo, an elderly taro grower up to recently (thanks to a subsidy by a photo concern, it is rumored) plowed his patch with this picturesque beast along the main highway at Waiahole (misspelled "Waihole"), Oahu, to entice tourists to use their cameras. Feral goats often enter lava tubes on the Island of Hawaii, at times dying there as their skeletons prove; but according to observations by a resident Hawaiian (pers. com., by Mr. Albert Lincoln), they avoid burial caves. On a dry ridge on Kauai the reviewer noted one billy, not cleaning his fur, but

apparently drinking his own urine to quench his thirst. Perhaps Dr. Tomich should have devoted a few paragraphs to notorious "Butch", the black bear (see Honolulu Advertiser of December 10, 1957 and Honolulu Star-Bulletin of February 4, 1970), who had escaped from captivity and was maintaining himself, hale and hearty, in the Koolau Mountains.

Under "Some Perspectives in Hawaiian Mammalogy", comprising twenty pages, are miscellaneous topics such as "Hawaiian Names of Mammals", a little about early whaling, rodents, diseases, "Animal Quarantine", ecological conditions on some of the smaller islands, etc.

Regarding Lanai, Dr. Tomich gives wise suggestions concerning the introduced goat, deer, pronghorn and mouflon. He failed to note an observation made during the reviewer's six months' botanizing there in 1963-64. Hunting encouraged in the lowlands and kapu, or forbidden, in the remnant, endemic rainforest tends to drive deer and goat for asylum into the forest, thus speeding its destruction by browsing and trampling. This error in game management, however, is today merely of academic interest for Lanai as the native forest since that time has been bulldozed in parallel strips and planted to loblolly pine (Pinus taeda)! As the trees increase in width and scatter their poisonous needles, the native flora will quickly succumb.

Being interested in the preservation of the native biota, the reviewer regrets that no mention is made of the Ecologist Union's resolution about two decades ago against the folly of liberating axis deer in the Hawaiian Islands. We in Hawaii, in our know-it-all conceit, pay little heed to the warning.

The reviewer has never before read through a Bibliography, but that in "Mammals in Hawaii", extending from page 140 through page 225, is so replete with interesting summaries that he has enjoyed doing so. One example, for the year 1907, reads as follows: ".... a citizen complained that her pet dog was taken to the pound by the dog warden and killed before the legal time limit had expired, to furnish food for a luau given by one Supervisor Kealoha and others." In fact, a few years ago, a part-Hawaiian protege of the reviewer visited a retired, well-to-do Polynesian taxi driver on rural Oahu. Wanting a drink of ice water, he opened his host's modern refrigerator and was aghast to find row on row of properly cleaned puppies. Why not? They are appealing as well as tasty animals. Remember, the English to this day butcher their aged, used-up royal coach horses for France's stew meat.

There is one glaring omission to this otherwise excellent book that hurts the reviewer to the quick. An immigrant in 1922 via the SS. Wilhelmina, he considers himself a thoroughly naturalized mammal in the Hawaiian Islands. In fact, he and his ilk have influenced, most banefully, the native and introduced biota of the Islands more than any other species of mammal. Why are not the variously naturalized forms and strains of Homo sapiens L., as thoroughly treated as wallaby, pig or goat; and above all, why is the endemic Hawaiian human being not given a chapter of his own? He is certainly about as distinct from other kinds of man as the Hawaiian rat, Ratus exulans hawaiiensis, is from the common Polynesian rat, R. exulans exulans, to the south and southwest. Both apparently reached the Hawaiian Islands at the same time in the same double canoe. This belief of the distinctiveness of the Hawaiian became a conviction in 1968. That year the reviewer remarked to his wife, on entering a New Zealand airport and observing a Polynesian lady at the Information Desk, that he noticed no difference whatsoever between Maori and Hawaiian. Later, inquiring about

conducted tours, he repeated his remark to the lady in question. Laughingly she replied that she was not Maori at all, but had come to New Zealand with her Hawaiian parents as a child! Polynesians have been isolated in the Hawaiian Archipelago evidently a sufficient length of time to have acquired distinctive traits not found in other peoples. The reviewer believes a second edition of Dr. Tomich's "Mammals in Hawaii" must include Homo sapiens forma hawaiiensis Deg., as the fourth endemic mammal.

* * * * * * *

Editor's Note. The reviewer, Dr. Degener, RR1, Box 89, Waialua, Hi., 96791, is author of "Naturalists's South Pacific Expedition: Fiji" which was published in 1949. With Fiji now in the news because of its recent independence, this book may deserve renewed attention. Copies may be purchased from Dr. Degener, $5.00.

New Publication

Horticulture Digest, Newsletter of the Dept. of Horticulture, U. H. No. 1 issued Oct. 1970. Quarterly.

Recent Book

Flowering Vines of the World. Edwin A. Menninger and 50 collaborators. 410 pages, 580 photographs. Heathside Press, Inc., New York, 1970. $25.00.

Recent Literature

Anonymous 1970
A checklist of palms in the Harold L. Lyon Arboretum. Harold L. Lyon Arboretum, University of Hawaii, 24 pp.

Atkinson, I. A. E. 1970
Successional trends in the coastal and lowland forest of Mauna Loa and Kilauea Volcanoes, Hawaii. Pac. Sci. 24:387-400.

Carlquist, Sherwin 1969
Wood anatomy of Lobelioideae (Campanulaceae). Biotropica 1:47-72.

Clements, H. F. 1970
Crop logging of sugar cane: nitrogen and potassium requirements and interactions using two varieties. Hawaii Agr. Expt. Sta., Tech. Bull. 81, 48 pp.

Crum, H. & D. Mueller-Dombois. 1968
Two new mosses from Hawaii", J. Hattori Bot. Lab. 31:293-296.

Degener, Otto and Isa. 1969
Flora Hawaiiensis versus Flora Hawaiiana. Taxon 18(5):571-572.

Degener, Otto and Isa. 1969
Review of HAVAJIN KASVISTOSTA JA KASVILLISUUDESTA. Reprinted from Phytologia XIX (1).

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Editor Russell K. LeBarron
(Hawaii Division of Forestry)

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3190 Maile Way
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